

6.2 Toilets and Urinals

There are three common varieties of toilets: gravity flow, (siphon-jet) flush valve, and pressurized tank systems. Similarly, there are four common varieties of urinals: the siphonic jet urinal, washout/wash-down urinals, blowout urinals, and waterless urinals. All of these must meet Federal water efficiency standards, though waterless urinals go far beyond the conservation minimums. Composting toilets also use no water, but potential applications are generally limited to national park facilities and small highway rest stops.

Opportunities

The vast majority of toilets and urinals in Federal facilities were installed at a time when there was little or no regard for using water efficiently. Consequently, there are ample opportunities to make significant savings in water usage. Complete replacement is the desired option. Retrofit of existing toilets and urinals is a second choice that may be more attractive if there are budget constraints. While retrofits reduce the amount of water used per flush, most fixtures were not designed to use reduced amounts of water and their performance may suffer. Only complete replacement of porcelain fixtures ensures that, even with less water, they can still perform efficiently and effectively.

Technical Information

Toilets account for almost half of a typical building's water consumption. Americans flush about 4.8 billion gallons (18.2 billion liters) of water down toilets each day, according to the U.S. Environmental Protection Agency. According to the Plumbing Foundation, replacing all existing toilets with 1.6 gallons (6 liters) per flush, ultra-low-flow (ULF) models would save almost 5,500 gallons (25,000 liters) of water per person each year. A widespread toilet replacement program in New York City apartment buildings found an average 29% reduction in total water use for the buildings studied. The entire program, in which 1.3 million toilets were replaced, is estimated to be saving 60–80 million gallons (230–300 million liters) per day.

There is a common perception that ULF toilets do not perform adequately. A number of early 1.6-gallons-per-flush (gpf) (6-liter) gravity-flush toilets that were simply adapted from 3.5-gpf (16-liter) models—rather

than being designed from the ground up to operate effectively with the ULF volume—performed very poorly, and some low-cost toilets today still suffer from that problem. But studies show that most 1.6-gpf (6-liter) toilets work very well. Where flush performance is a particular concern, or water conservation beyond that of a 1.6-gpf (6-liter) model is required, pressurized-tank toilets, vacuum toilets, and dual-flush toilets should be considered. Carefully choose toilet models based on recommendations from industry surveys or experienced plumbers and facility managers. You may also want to contact some managers of facilities that have already installed the toilets under consideration.

While some retrofit options for toilets reduce water use (see next page), none of these modifications will perform as effectively or use as little water as quality toilets manufactured after January 1, 1994. These retrofits will merely allow the fixture to operate using less water until it is replaced.

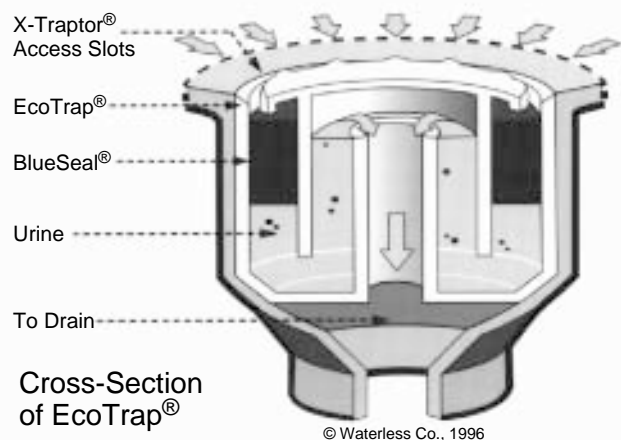
Even greater water conservation can be achieved in certain (limited) applications with composting toilets. Because of the size of composting tanks, lack of knowledge about performance, local regulatory restrictions, and higher first-costs, composting toilets are rarely an option except in certain unique applications, such as national park facilities. Composting toilets are being used very successfully, for example, at Grand Canyon National Park.

With urinals, water conservation well beyond the standard 1.0-gpf (4.5-liter) performance for new products can be obtained using waterless urinals. These products, available from The Waterless Company, use a special trap with a lightweight biodegradable oil that lets urine and water pass through but prevents odors from escaping into the restroom; there are no valves to fail, and clogging does not cause flooding. Three Waterless

PROJECTED WATER SAVINGS FROM INSTALLING WATERLESS URINALS

Building Type	No. Males	No. Urinals	Uses/ Day	Gal/ Flush	Days/ Year	Ann. Water Savings/Urinal Gallons	Urinal Liters
Small Office	25	1	3	3.0	260	58,500	220,000
	New const. 25	1	3	1.0	260	19,500	73,800
Restaurant	150	3	1	3.0	360	54,000	204,000
	New const. 150	3	1	1.0	360	18,000	68,100
School	300	10	2	3.0	185	33,300	126,000
	New const. 300	10	2	1.0	185	11,100	42,000
Source: <i>Environmental Building News</i> , February 1998.							

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The low-specific-gravity BlueSeal® fluid in this Waterless Urinal allows urine to pass through while serving as a trap to block odors from entering the restroom.

urinals at the Bureau of Recreation's Glen Canyon Visitor Center are saving an estimated 225,000 gallons (850,000 liters) of water per year, according to *Environmental Building News* (February 1998). Furthermore, installing those urinals enabled the Bureau to avoid spending \$600,000 to expand its on-site sewage treatment capacity. Projected water savings from waterless urinals in different types of facilities are shown in the table on page 136—both for retrofits and new construction.

TOILET AND URINAL RETROFITS

Adjust the flush valve to reduce the water used per flush without impeding waste removal or violating the manufacturer's requirements.

Regularly check for leaks and periodically replace valves and ballcocks. Use toilet cleaners that are not highly corrosive to flapper valves.

Check water pressure to ensure that the pressure is proper for optimal toilet or urinal operation.

Early closure devices can save 1 to 2 gallons (4.5 to 9 liters) per flush. These devices cause the same force to be exerted with each flush but with half the water.

Dual-flush adapters can be used with some toilets; these allow two types of flushes, saving up to 1.2 gallons (5.5 liters) per flush. One flush is standard and removes solids; the second is smaller and removes paper and liquids.

Toilet refill diverters are extremely low-cost devices that balance the flow of refill water in gravity-flush toilets. With most toilets, the bowl fills a lot faster than the tank, and excess water in the bowl simply flows down the drain—this occurs even in 1.6-gpf (6-liter) toilets. Products made by the Fuller Group of Marietta, Georgia, and Niagara Conservation Corp. of Cedar

Knolls, New Jersey, divert most of the bowl-refill water into the tank, typically saving 1/2 to 1 gallon (2 to 4 liters) per flush on an older toilet and about 1/4 gallon (1 liter) on a new toilet. *Environmental Building News* (March 1999) reported that the Marriott Corporation has installed the Fuller AquaSaver product on 280,000 of their 480,000 toilets and is saving \$3.4 million per year in water bills.

For siphonic jet urinals, retrofit with infrared sensors to eliminate double flushing, or replace. Choose 0.5-gpf (1.9-liter) models instead of 1.0-gpf (3.8-liter) models for greater savings.

Blowout urinals, which discharge at intervals as the water tank reaches a given level, can be modified (with sensors) to function only when the building is occupied.



Displacement devices, such as bags or bottles, and toilet dams are not recommended for 5-gpf (23-liter) or 3.5-gpf (16-liter) toilets because they can compromise flushing performance, resulting in double-flushing or increased need for cleaning. Early-closure flappers work better but must be properly calibrated.



The Prince Kuhio Federal Building and Post Office in Honolulu is a 10-story building housing 1,400 employees. A complete toilet and urinal replacement program is saving 8.8 million gallons (40 million liters) of water there annually. With the total cost of replacement estimated to be about \$235,000, annual savings in sewer and water bills are about \$31,000.

References

"Water Saving Restroom Fixtures," Federal Energy Management Program, U.S. Department of Energy, 1995. This publication and the *WATERGY* software, which quickly screens facility water consumption, are available by calling the FEMP Help Desk, (800) DOE-EREC (363-3732); also see the FEMP Web site, www.eren.doe.gov/femp/.

The WaterWiser Web site includes hundreds of useful links on water conservation practices and products: www.waterwiser.org.

Wilson, Alex, "Big Savings from Waterless Urinal," *Environmental Building News*, Vol. 7, No. 2, February 1998; BuildingGreen, Inc., Brattleboro, VT; (800) 861-0954; www.BuildingGreen.com.